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AMBROISE PARÉ, SURGEON TO THE KING.

Ambroise Paré and his Times, 1510-1590. By Stephen Paget. Illustrated. (New York and London: G. P. Putnam's Sons; The Knickerbocker Press, 1897.)

ON October 1, 1889, Mr. Rickman J. Godlee delivered the introductory address in the Faculty of Medicine at University College, London. He chose for his subject a comparison of the methods of Ambroise Paré and those of a surgeon of the present time. This address, according to Mr. Paget's preface, was the moving cause of this present work. Seldom has it fallen to our lot to read a better bit of literary work, or a more stimulating biography. The author has extracted from the larger works of Malgaigne, Le Paulmier, and others the most salient points in Paré's life, and pieced them together in such a way that one has a real view of the life of the most celebrated surgeon of the sixteenth century. He has added to our literary medical store by a new translation of the "Journeys in Diverse Places," which, for faithful rendering and for the preservation of the quaint phraseology of the period, might have been done by Thomas Johnson himself, he who translated "The Works of that Famous Chirurgeon Ambrose Parey" into the vigorous and picturesque language of the earlier part of the seventeenth century. The interest to the modern general reader consists in the vivid picture of life as painted by one who saw it under every possible circumstance in the sixteenth century, and to the yet young practitioner, inasmuch as the surgery of Paré was practically the art of but yesterday until the total revolution, caused in it by the discoveries of Lister, had changed it to what it is now. Paré used to be mostly remembered at opening lectures as Hannibal was in Juvenal's time, "Ut pueris placeas, et declamatio fias," and his memory was called to mind chiefly as the inventor of the ligature of arteries. Now this he did not, but only reintroduced the practice, which had been restored about a century before by the German school of surgery, and lost sight of in the meanwhile. He was, however, the first to use the ligature in amputation wounds. He found out, by a scarcity of boiling oil on one occasion, that a mild application was infinitely to be preferred to that dreadfully severe one, and so set the practice of a more rational treatment of gunshot wounds. But Paré added little to the actual knowledge or practice of his art; his chief fame is due to the admirably clear writings he has left of that art as he practised it, and to the straightforward honest life he led in the midst of the most horribly cruel, licentious and debased surroundings it is possible to imagine. It is generally stated that Paré was a Protestant, and one of the very few who were spared at the St. Bartholomew massacre; but we think Mr. Paget has shown that there is good cause to believe that he was, nominally at least, a Gallican Romanist of the tolerant sort. We have selected a few extracts showing the conditions of war as Paré

met with them. In the first journey, viz. to Turin, 1537, after the taking of the city, he writes:—

"We entered pell-mell into the city, and passed over the dead bodies and some not yet dead, hearing them cry under our horses' feet, and they made my heart ache to hear them. And truly I repented I had left Paris to see such a pitiful spectacle. Being come into the city, I entered into a stable, thinking to lodge my own and my man's horse, and found four dead soldiers and three propped against the wall, their features all changed, and they neither heard, saw, nor spoke, and their clothes were still smouldering where the gunpowder had burned them. As I was looking at them with pity, there came an old soldier, who asked me if there was any way to cure them. I said no. And then he went up to them and cut their throats, gently, and without ill-will toward them. Seeing this great cruelty, I told him he was a villain: he answered me, he prayed God, when he should be in such a plight he might find some one to do the same for him, that he should not linger in misery."

Again, on page 71 is an appreciation of the Spaniard of that time, which is the same that the English had, and is curiously like some of the denunciations one reads in the State papers and writings of the latter part of the reign of Elizabeth: it is as follows. After describing the departure of the Imperials from Metz, he goes on:—

"M. de Guise had their dead buried and their sick people treated. Also the enemy left behind them, in the abbey of St. Arnoul, many of their wounded soldiers, whom they could not possibly take with them. M. de Guise sent them victuals enough, and ordered me and other surgeons to go dress and physick them, which we did with a good will; and I think they would not have done the like for our men. For the Spaniard is very cruel, treacherous and inhuman, and so far enemy of all nations: which is proved by Lopez the Spaniard, and Benzo of Milan, and others who have written the history of America and the West Indies; who have had to confess that the cruelty, avarice, blasphemies and wickedness of the Spaniards have utterly estranged the poor Indians from the religion that these Spaniards professed. And all write that they are of less worth than the idolatrous Indians for their cruel treatment of these Indians."

As pointing out the immense slaughter in the battles of those times, note the account of the battle of Dreux, 1562:—

"The day after I came, I would go to the camp where the battle had been to see the dead bodies. I saw for a long league round the earth all covered. They estimated it at 25,000 men or more, and it was all done in less than two hours."

We believe that no modern battle of a like duration has produced such a loss. One more extract, and we have done; it relates to the evacuation of Havre by the English in 1563.

"When our artillery came before the walls of the town, the English within the walls killed some of our men and several pioneers who were making gabions; and, seeing they were so wounded that there was no hope of curing them, their comrades stripped them and put them living inside the gabions, which served to fill them up. When the English saw they could not withstand our attack because they were hard hit by sickness, and especially by the plague, they surrendered. The king gave them ships to return to England, very

glad to be out of this plague-stricken place. The greater part of them died, and they took the plague to England, and they have not got rid of it since."

The book is well illustrated by reproductions of old prints and pictures and drawings of the places as they exist to-day. It is one of the most entrancing studies we have met with, and can be read over and over again. We heartily congratulate Mr. Paget on his work.

CAYLEY'S MATHEMATICAL PAPERS.

The Collected Mathematical Papers of Arthur Cayley, Sc.D., F.R.S. Vols. x., xi. Pp. xiv + 616; xvi + 644. (Cambridge: at the University Press, 1896.)

THIS instalment of the papers illustrates in a remarkable way Cayley's power of commenting upon and developing the work of his predecessors. The various memoirs on single and double theta-functions are, of course, based upon the results of Rosenhain, Göpel, and Kummer; and it is instructive to see how Cayley's instinct for symmetry and logical consistency has enabled him to present the theory in a compact and intelligible form. In the case of the single theta-functions, defined by their expansions in series, we have equations such as

$$\theta_{00}^2(u+v)\theta_{00}(u-v) = \theta_{00}^2(u)\theta_{00}^2(v) + \theta_{11}^2(u)\theta_{11}^2(v) \dots (i.)$$

and from these it appears that any three of the squared functions $\theta_{gn}^2(u)$ are connected by a linear relation. Hence we may take the squared functions to be proportional to $A(a-x)$, $B(b-x)$, $C(c-x)$, $D(d-x)$ with x a variable, and the other quantities constant. Finally it is shown that x and u are connected by a differential equation of the form

$$du = \frac{Mdx}{\sqrt{(a-x)(b-x)(c-x)(d-x)}}$$

Proceeding next to the double theta-functions, Cayley gives a set of 256 equations analogous to (i.); from these are derived quadric relations between the 16 functions which give, in all, 72 aszygetic relations; it is assumed, and is fairly evident, that these are *all* the independent relations. The existence of the Kummer hexads and Göpel tetrads gives a special character to these relations. The next step is to find algebraic functions of two variables x, y and a proper number of constants which, on being substituted for the 16 theta-functions, satisfy the quadric relations identically. This Cayley succeeded in doing, apparently by a series of happy guesses; and this is his main contribution to the theory. He also shows that the two sets of variables u, v and x, y are connected by differential relations of the form

$$\sigma du + \tau dv = \frac{1}{2} \left(\frac{dx}{\sqrt{X}} - \frac{dy}{\sqrt{Y}} \right), \quad \varpi du + \rho dv = -\frac{1}{2} \left(\frac{xdx}{\sqrt{X}} - \frac{ydy}{\sqrt{Y}} \right),$$

where $\varpi, \rho, \sigma, \tau$ are constants, $X = (a-x)(b-x) \dots (f-x)$, a sextic in x , and Y is the same function of y that X is of x .

In order to complete the theory, from this point of view, it is necessary to find the connection between the constants which occur in the theta-functions as originally defined and those which are contained in the corresponding algebraical expressions. This can, in fact, be done

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for the single theta-functions (vol. x. p. 482); Cayley began, but did not finish the corresponding investigation for the double theta-functions (*ibid.*, pp. 563-564).

It would probably be well worth while to work out the relations of Cayley's theory to recent researches on hyperelliptic sigma-functions by Klein, Burckhardt and others. The best general view of Cayley's results is to be found in the "Memoir on the Single and Double Theta-Functions" (No. 704).

Suggested by the theta-function theory, there are several important geometrical papers, as, for example, on the 16-nodal quartic surface, and on the bitangents of a plane quartic.

The memoir "On the Schwarzian Derivative and the Polyhedral Functions" is chiefly valuable for its detailed analytical work, which is a great help to the proper appreciation of the papers of Kummer and Schwarz, especially the latter. In this connection it is proper to mention Cayley's own papers on the correspondence of homographies and rotations and on finite groups of linear substitutions (Nos. 660, 752).

Of the other papers on group-theory the most important is No. 690; this contains the "colour-diagram," and the maxim, adopted by Dyck as the motto of his "Gruppen-theoretische Studien": "A group is defined by means of the laws of combinations of its symbols." This ultimate symbolical form of a group is, so to speak, its transcendental essence, which may become incarnate in an endless variety of shapes, such as sets of permutations, geometrical configurations, motions in space, and so on.

In the region of pure algebra we may notice the tenth memoir on quantics, which gives a very complete account of the binary quintic; tables for the binary sextic and ternary cubic; and a paper on the Jacobian sextic equation.

Vol. xi. contains a reprint of the articles contributed by Cayley to the "Encyclopædia Britannica." These, perhaps, will convey to the general reader some sense of his characteristic qualities as a writer; clearness, order, philosophical breadth and independence of view, combined with a studied restraint of manner which sometimes inclines to coldness. This reserve arose, probably, from an excess of sensitiveness, which made him follow an ideal of classic severity and shrink from any open expression of emotion. That he fully appreciated the æsthetic side of mathematics is clear from the well-known passage in his presidential address to the British Association, where he describes the extent and variety of modern mathematics by a metaphor of great beauty and appropriateness. But this is a rare, if not solitary exception to his usual custom; to gain a true idea of his personal charm we must appeal, not to his published work, but to the testimony of the friends who knew him well. For them the portrait prefixed to vol. xi., which shows Cayley as he was in 1885, will form a touching memorial.

Of the numerous minor papers, and of the problems and solutions contributed to the *Educational Times*, it is needless to say anything here. Diamond-dust from the lapidary's workshop, they will doubtless help to polish gems not yet extracted from the mine. G. B. M.